Attachment 1

Project No. IVH-9237(601)

Charlotte, North Carolina

IVHS Early Deployment Study

Cooperative Agreement Between

The Federal Highway Administration

and

The North Carolina Department of Transportation

The Federal Highway Administration (FHWA) hereby approves the request of the State of North Carolina dated March 25, 1992 for Federal assistance funding for an IVHS Early Deployment project for an areawide study of potential IVHS deployment activities in the Charlotte metropolitan area pursuant to 23 USC 307.

1. Estimated Cost

   The State shall be reimbursed for allowable costs incurred in the performance of work under this award in an amount not to exceed $400,000. The maximum Federal share for this project shall not exceed 80 percent of the total cost, as agreed to by the State.

2. Responsibilities of the State

   The State shall perform, or cause to be performed, the work defined in Activities 1 through 7 of the attached proposal, "Congestion Avoidance and Reduction for Autos and Trucks (CARAT) - Early Deployment Planning Project", transmitted March 25, 1992. The attached proposal is hereby incorporated into this contract document.

3. Schedule

   The period of performance is expected to be 18 months from the date of execution of this contract.

4. FHWA Participation

FHWA shall be considered as an oversight and guidance agent in this IVHS Early Deployment Project. The State will provide the FHWA Division Office with quarterly status reports and information 'on working group meetings and copies of correspondence. A designated staff person in the FHWA regional and headquarters offices will also be notified of meetings and receive copies of status reports.

5, Reporting Requirements

Each quarter the State shall submit to FHWA project progress report, which briefly summarizes work accomplished, work planned, problems encountered, recommended solutions, and any other pertinent information.

6. Documents

The product described in the attached proposal will be provided in draft for review by FHWA.

7. Programmatic Changes

The State must obtain prior approval from FHWA whenever any significant change is anticipated. These include, but are not limited to:

(1) Any revision of the scope or objectives of the project (regardless of whether there is an associated budget revision requiring prior approval).

(2) Need to extend the period of availability of funds.

(3) Changes in key personnel, program manager, or prime contractor.

8. Technology Transfer

FHWA shall have unlimited rights to the work developed in performance of this Agreement. Unlimited rights are defined as the right to use, disclose, reproduce, prepare derivative works, distribute copies to the public, in any manner and for any purpose, and to have or permit others to do so. The State shall make available to FHWA three copies of all work developed in the performance of this Agreement. The State agrees to place the work developed in performance of this Agreement in the public domain.

9. Costs

The State shall limit its progress claims and final claims to those costs incurred in accordance with this Agreement and to submit its final claim within 90 days after the project is completed.

10. Additional Requirements

The State shall comply with all laws, regulations and FHWA requirements applicable to this Agreement and with the general provisions set forth in Appendix A hereto.

Il. Certification Regarding Lobbying

By executing this Agreement, the State makes the Certification regarding lobbying which is attached hereto as Appendix B.

12. Termination

The State shall notify FHWA immediately of any intent to terminate this Agreement.

13. Effective Date

This Agreement is effective upon execution by both parties to this Agreement.

Federal Highway Administration

Nicholas L. Graf

Nicho[redacted]. Graf

Division Administrator

Date 6/12/92

North Carolina Department of Transportation

W.G. Marley, Jr.
State Highway Administrator

Date June 10, 1992

Probably 1st priority for Early Deployment # 1 Charl.
More detailed Proposal being finalized.

RECEIVED
Reg. 4 F.H.W.A.
FEB 07 1992

STATE OF NORTH CAROLINA..

DEPARTMENT OF TRANSPORTATION
P. 0. BOX 25201
RALEIGH 27611-5201

JAMES G. MARTIN
GOVERNOR

FHWA IVHS $400,000 +
TOTAL >>>

THOMAS J. HARRELSON
SECRETARY

	DEP ADM	
✓	DEP REG ADM	
	REG COUNSEL	
	DIR CIVIL RTS	
	DIR ADMIN	
	DIR ENG	
✓	DIR TECH	
	DIR STRS	
	DIR SYSTEMS	
	DIR OMC	
	FILES	

January 30, 1992

Dr. Thomas D. Larson
Federal Highway Administrator
U. S. Department of Transportation
400 D Street, SW
Washington, DC 20590

Dear Dr. Larson:

Re: Concept for an Innovative IVHS Project for the Charlotte, NC Urban Area - CARAT (Congestion Avoidance and Reduction for Autos and Trucks]

As I indicated to you at our meeting on January 15, the North Carolina Department of Transportation has been developing an innovative approach to the phased implementation of state-of-the-art IVHS technologies to address traffic congestion problems in our state.

One of the geographical regions that has received some priority in addressing congestion management is the Charlotte urban area. Recently, several units of our Department, including the Division of Highways, Division of Motor Vehicles, and the Governor's Highway Safety Office, among others, have been rapidly reaching a consensus on an approach that has been under development for the past several months. Our efforts are being proposed as a collaborative effort with local governments in the Charlotte area, the University of North Carolina system, and other state agencies such as the State Highway Patrol and the Division of Emergency Management.

The project we have proposed is called CARAT, for "Congestion Avoidance and Reduction for Autos and Trucks. The FHWA, NCDOT, and ITRE through the Regional University Centers program have funded a research project at UNCC to examine the consumer markkting aspect of CARAT.

Coincidentally, on the day that we were meeting to discuss this proposed project, a paper describing the CARAT proposal was being presented at a session of the Transportation Research Board. The CARAT acronym was initially coined by Dr. David Hartgen and Dr. Doug Robertson as they and their colleagues at The University of North Carolina at Charlotte were working on the research project. The concept for a continuing, comprehensive, and collaborative development and implementation of the CARAT project has recently been expanded by NCDOT to include a broad-scale congestion management program with a wide variety of IVHS components.

Several elements of the overall CARAT project will be discussed briefly herein. The total concept will be presented in more detail in a formal proposal that will be forwarded to the FHWA within a month. On-going elements of the CARAT project focus in the Charlotte area, including:

- Organization of a Congestion Management Policy Committee by State Highway Administrator W. G. Marley, Jr.

- Organization of several multi-agency task forces headed by the NCDOT, with prescribed technical foci for development and implementation of Congestion Management solutions, including a Task Force for Incident Management, a Task Force for IVHS Development and Implementation; and a Task Force dealing with Fuel Tax Evasion issues

- Installation of loop detectors and communications conduit for a 6-mile section of I-77, due to be let to contract in August, 1992, as a first phase in installing a freeway management system

- Comprehensive Alternate Route Planning for a l4-mile section of I-77, that will be reconstructed over the next three years; this section includes the initial 6 mile section and is being coordinated with alternate route planning for I-85 and the Independence Blvd. HOV project in the Charlotte area

- Implementation of NCDOT Motorist Assistance Patrols for the I-77 and I-85 corridors, along with a local area Incident Management Team and Motorist Assistance Patrols

- Implementation of a statewide Radio Advisory System at Interstate entrance points, which will be integrated with the CARAT project in the Charlotte area

An additional element of CARAT is the development of. a concept for a long-term consumer/ traveler information marketing program for the Charlotte region, beginning in the I-77 corridor and ultimately expanding to other freeways. The concept is that our long-term

IVHS program in the Charlotte region would expand to the I-85 corridor, the proposed outer loop, and Independence Boulevard.

The centerpiece of the CARAT proposal is an ATMS project in Charlotte composed of a freeway and parallel arterial surveillance and control component, and a safety management component (including incident management), which is coordinated and operated from a central command and control center.

The NCDOT proposal will ask that Charlotte be designated as an IVHS operational test site so that ATMS (and later CVO and ATIS) strategies, technologies, institutional models, and state-of-the-art hardware can be tested and evaluated. As the program develops, other major arterials, and ultimately the current and planned Charlotte freeway system in its entirety will provide a dynamic, multi-dimensional program in mid-sized metropolitan areas.

A continuous evaluation component that will in part be conducted by the university system will measure the results as the various elements of the congestion management system are brought on-line. Technology transfer and training will aid in improving traffic congestion problems in other mid-sized metropolitan areas throughout this country.

Critical features of our proposal on Congestion Avoidance and Reduction for Autos and Trucks will include:

- Use of an innovative design - build contract for implementing the project, including the use of performance and product specifications and guaranteed "finished product" performance, under FHWA SEP 14 guidelines

- Development of a freeway surveillance and traffic management system for the entire freeway system and connecting arterials in the Charlotte urban area

- Analysis and recommendations, with possible further development required, for the early deployment of appropriate, alternative communications technologies, including those systems that may be deployed in ATMS, CVO, and ATIS environments

- Analysis and recommendations for further application of a variety of data collection systems to disseminate market-based consumer information on route choice and other traveler decisions, and the commercial use of those data

- A system for dealing with fuel tax evasion issues

NCDOT administrators and staff are currently conducting a series of dialogues with private sector vendors, consulting firms, and systems integrators, including the tele-communications and communications industries, about a public-private approach to the CARAT project. Several meetings are being held over the next few weeks to ensure the most up-to-date application of technological innovations that are utilized in this project.

The NCDOT concept for an IVHS implementation project includes linking the management and implementation issues of IVHS deployment to the technological base. One strength of North Carolina's approach to the early deployment of IVHS technologies is that the NCDOT is the lead state agency among the eight states in Region IV in a current effort sponsored by the FHWA to develop procedures to overcome institutional barriers and technical reporting impediments in implementing integrated commercial vehicle operations. The NC Division of Motor Vehicles is the lead state agency in this project, which is being closely coordinated with CARAT activities through the Congestion Management Policy Committee and the various task forces.

We envision the innovations and technologies to be implemented in the Charlotte area will include, but not be limited to:

- Use of performance based specifications
- Design-build innovations in contracting practice, including guaranteed performance provisions
- Solar call boxes
- Tower mounted video camera surveillance and image sensing technology
- Incident detection and coordinated response
- Incident management using route diversion
- Ramp metering
- Inductive loop, and/or infrared, and/or radar detection
- Stationary and portable variable message signs
- Fiber optic cable and/or spread spectrum radio communications from detectors to the central control center
- Real time traffic control
- Advanced traveler advisory radio

- An innovative consumer marketing approach to providing traveler information to the public and various users

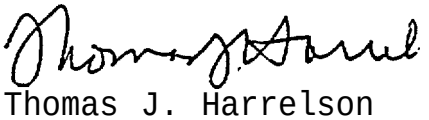
- A real-time video and data communications link from the central communications command and control center (to be located in the I-77 corridor) to a research and training laboratory located on the UNC-Charlotte campus

Applications in the university laboratory will focus on congestion avoidance and reduction effectiveness of IVHS technologies, safety impacts, human factors issues, and development of a consumer marketing element for the project. The training of engineers and other highway professionals, as well as technicians and traffic control center operators in both real-time and simulated environments will also be featured in the university center. The center will be integrally tied into the Southeastern Consortium for University Transportation Centers (the Region IV Center), which is managed by ITRE for the University of North Carolina system.

Our formal proposal will be forwarded through appropriate channels in order to reach your office by February 28, 1992. I have discussed this concept in considerable depth with Mr. Leon Larson and with Mr. Nick Graf, as well as with State Highway Administrator Bill Marley and his staff. We are appreciative of the excellent cooperation and suggestions made by the Regional and Division FHWA offices. If there is any interim information we need to provide you before the formal presentation of our proposal, please let me know.

If your schedule allows it, the NCDOT and the City of Charlotte would like to invite you to Charlotte or Raleigh for a briefing on the elements of our proposal. We will be in touch with your office shortly to arrange this event. I look forward to discussing this concept with you further.

Yours truly,



Thomas J. Harrelson

cc: Governor James G. Martin
Lt. Governor Jim Gardner
Mr. Ernest Barry
Mr. Jim Nance
Mr. W. G. Marley, Jr., P.E.
Mr. Leon Larson, P.E.
Mr. Nick Graf, P.E.

bcc:
Mr. Rusty Goode
Mr. Bob Pressley, P.E.
Ms. Hannah Byron
Mr. Wayne Bailey, P.E.
Dr. Larry Goode, P.E.
Mr. Tommy Peacock, P.E.
Mr. Jimmy Lynch, P.E.
Dr. Edd Hauser, P.E.

CONGESTION AVOIDANCE AND REDUCTION FOR AUTOS AND TRUCKS (CARAT)

A PROPOSED IVHS DEMONSTRATION PROJECT FOR THE CHARLOTTE URBAN AREA

COMPONENTS

* ADVANCED TRAFFIC MANAGEMENT SYSTEM (ATMS)
  - Congestion Management objective
  - Freeway management system core concept
  - Includes connecting arterials surveillance and control
  - State of the art communication and surveillance alternatives to be considered
  - Freeway Incident Management - subsystem of Congestion Management System
  - Central Traffic Control Center - probably located in I-77 corridor

* ADVANCED TRAVELER INFORMATION SYSTEM (ATIS)
  - Research/Teaching/Information dissemination objective
  - Market demand-based traveler (consumer) information system
  - Separate UNC - Charlotte Consumer Transportation Data Center - probably located on UNCC campus
  - Connecting communications link to Traffic Control Center

* COMMERCIAL VEHICLE OPERATIONS (CVO) COMPONENTS
  - CVO "Institutional Issues" tie-in (Region IV)
  - Fuel Tax Evasion Detection system (Mid-Atlantic region)

* INNOVATIVE CONTRACTING PROPOSAL
  - Design - build contract
  - Performance based specifications
  - Final product/system warranties

CARAT Proposal, continued

SCOPE

* FIRST PHASE FOCUSING ON I-77 CORRIDOR
  - From SC line to 2 miles north of I-85 interchange
  - Includes connecting arterials and alternate construction routes

* ADDITIONAL PHASE(S) TO INCLUDE THE PROPOSED 142-MILE CHARLOTTE FREEWAY SYSTEM
  - Approximate cost per mile of $1.15 million
  - Additional cost to the above for Independence Blvd. HCV lanes

STATUS

* Draft proposal in preparation-expected availability 2/20/92
* Proposal to be submitted to FHWA by end of February
* Issues:
  - Preliminary review/funding discussion w/ FHWA
  - Staging/phasing of construction
  - Total cost; matching share
  - Feasibility of "subscription" concept (ATIS component)
  - Relationship to CVO statewide projects
  - Relationship to statewide Radio Communication system proposal at Interstate entry points (coord. w/ Crime Control & Public Safety)
  - Collaboration with statewide Congestion Management initiatives
  - Collaboration with statewide Incident Management initiatives

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

CONGESTION AVOIDANCE AND REDUCTION FOR AUTOS AND TRUCKS (CARAT)

Early Deployment Planning Project

SCOPE

Over the past several months, the North Carolina Department Of Transportation (NCDOT) has been developing the concept and plan for the long range deployment of IVHS technologies in several areas of the state. One of these IVHS deployment projects is being planned for the Charlotte Urban area, and eight county regions which include two counties in neighboring South Carolina.

The project in Charlotte is called CARAT, Congestion Avoidance and Reduction for Autos and Trucks. This project is primarily a Freeway Traffic Control project, and will focus on both congestion relief and incident management, The overall Goals and Objectives of the CARAT project are:

(1) Improve safety and overall system performance for the Charlotte Urban Area Transportation System;

(2) Decrease congestion on the freeway system and major arterials;

(3) Provide an operational test area for the deployment of IVHS technologies;

(4) Demonstrate the effectiveness of IVHS technologies in medium-sized urban areas;

(5) Test an innovative approach to implementing an advanced freeway management system with a Design-Build-Warrant contracting procedure; and

(6) Provide a mechanism to effectively evaluate the system as it is being installed and operated, and provide a means to conduct research and train transportation professionals in advanced Traffic Management Systems and Advanced Traveler Information Systems.

In order to develop a more comprehensive approach to the CARAT project, the NCDOT is requesting funds from the FHWA for an Early Deployment project, to be set up through a Cooperative Agreement. The details of the overall CARAT project have previously been reviewed by the FHWA in a draft "overview" report.

This document details the activities, anticipated products schedule, funding requirements, and committments made to eupport a request to the FHWA for Early Deployment Funding.

ACTIVITIES

The primary intent of Early Deployment activities in the CARAT Project is to develop a component of the continuing coordinated, comprehensive transportation planning process for the Charlotte Metropolitan area. This process has been underway for the past several months through the continuing joint planning program in the Statewide Planning Section of the Department and the Traffic Engineering Branch.

As one element of this continuing cooperative effort, an R&D project sponsored by the FHWA, NCDOT, and WC Institute for Transportation Research and Education at UNC-Charlotte has developed an overall analysis of IVHS deployment needs for the region. This research project specifically developed a concept for a consumer-based marketing approach for an Advanced Traveler Information System for the Charlotte Urban Area. This component will continue to be developed in more detail as part of this Early Deployment planning project. The research project report, in draft form, has already been reviewed by the FHWA.

The following set of activities will be carried out by the NCDOT to further supplement these previously completed planning and research elements. These activities will be conducted in collaboration with the City of Charlotte, the University system, and other participants in the the CARAT project. Early Deployment activities include:

#1 Review ATMS and ATIS system deployment and planning efforts in other state and local transportation departments.

#2 Conduct a series of "technology transfer seminars" with potential private sector participants including organizations with the following capabilities:

- System integration
- Traffic engineering
- Software development
- Communications systems
- Control systems hardware manufacturing
- Vehicle manufacturers
- Trucking industry
- Travel industry
- Bonding industry (for design-build-warrant contract)

#3 Review and synthesis IVHS technologies to assure the Department is considering all the latest available capabilties andhas a process in place to continue to track current technological developments in the field.

#4 Analyze the status of transportation planning data and processes in the Charlotte Urbah Area (both state and local activities), and determine how best to assure continuing consideration of IVHS deployment in the following processes:

- Network analysis
- Congestion management and travel demand management (TDM)
- Safety analysis and response (accidents, other incidents)
- Air quality analysis
- Future capacity analysis

#5 Refine goals and objectives for IVHS deployment based on the above analyses,

#6 Develop a deployment plan for implementing IVHS technologies in the Charlotte Urban Area:

- Preliminary performance specifications
- ATMS technologies
- ATIS technologies
- CVO coordination
- R&D support
- Training and educational support

#7 Develop a schedule and budget for CARAT implementation.

PRODUCTS

Early Deployment Funding would result in an overall areawide plan for IVHS Deployment in the Charlotte Urban Area. This would include a reviewing process of responsible agencies, organizations, and companies, along with the detailed analysis of technologies, routes, and corridors. The funding would also create system plans for both Congestion Management and Incident Management. The major output of the CARAT "Early Deployment Project" will provideanswers to the following questions:

(1) What is the overall structure of the CARAT IVHS program, in terms of its components and activities and the way in which these interrelate?

(2) What is the time frame for the overall program, and for each individual project?

(3) What locations in the Charlotte Urban Area will be used to develop and evaluate IVHS technologies in the program3

(4) What public and private sector organizations will be involved in the activities?

(5) What technologies will be developed through the program, and what will be the benefits of their use?

(6) What criteria and environments will be used to assess the performance of technologies developed in the program?

(7) What will be the cost of the CARAT program, in terms of individual projects and activities and overall program management?

(8) What sources of funding are available for the program?

(9) What is the ultimate goal of the program, and the future direction after completion of the work?

The Areawide Implementation Plan for the CARAT project in the Charlotte Urban Area that results from this Early Deployment study will provide answers to these questions, and will form the basis for deploying IVHS technologies in the Charlotte area as part of Operational Tests or perhaps an FHWA Corridor Project. A formal proposal for funding through the Operational Tests program and the “other Corridors" program will be forwarded to the FHWA at the appropriate time.

will also deploy w/ Regular Fed Aid in TIP

SCHEDULE

The IVHS CARAT Early Deployment Planning Project will take approximately six months to complete. The elements, previously detailed as #l through #7, in the ACTIVITIES section are listed below with their estimated time of beginning and completion;

#1 - Month 1
#2 - Month 1 and Month 2
#3 - Month 3
#4 - Month 1 and Month 2
#5 - Month 4
#6 - Month 4 through Month 6
#7 - Month 6

NOTE: If a consultant is hired to conduct the analyses and overall plans, a nine month time frame would be required.

FUNDING

It is requested that a Cooperative Agreement in the amount of $500,000 be allocated for this Early Deployment Project, with a 80/20 funding ratio. The NCDOT will supply 20 percent matching funds for this project from currently budgeted state revenues.

COMMITMENT

The concept for the CARAT project in general had a multiple funding research and development project, as mentioned above. That R&D effort was funded with FHWA, NCDOT, and ITRE funds. The project was carried out by the University of North Carolina at Charlotte, in collaboration with the City of Charlotte and a number of agencies and private sector participants.

Likewise, this Early Deployment project will be a collaborative venture, headed by the NCDOT. Attached to this proposal is a Resolution passed on March 18, 1992 by the Charlotte MPO, which illustrates the broad, cooperative base of support for the overall CARAT project.

RESOLUTION

CHARLOTTE-MECKLENBURG
METROPOLITAN PLANNING ORGANIZATION

WHEREAS, Freeway congestion creates significant problem for the citizens of Charlotte, causes increased air polution and consumption of energy restrains our economy by hampering the flow of goods and services, and increases the number of traffic accidents; and

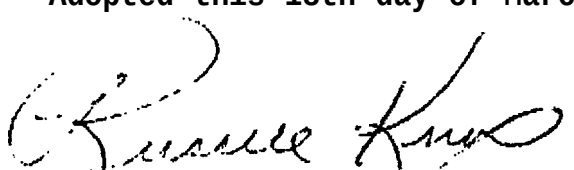
WHEREAS, Studies throughout the country have indicated that the majority of freeway congestion is created by accidents and other incidents, and the duration and impact of this delay can be reduced significantly by Intelligent Vehicle-Highway Systems (IVHS) to monitor the freeway, manage response to incidents on the freeway, and communicate with the motorists and the general public concerning incidents; and

WHEREAS, The North Carolina Department of Transportation in cooperation with the University of North Carolina at Charlotte, the Institute for Transportation Research and Education and the City of Charlotte has prepared a proposal for federal funding of a program for Congestion Avoidance and Reduction for Autos and Trucks (CARAT) to be considered for funding by the U. S. Department of Transportation as an IVHS project; and

WHEREAS, This CARAT project would provide a Freeway Incident Management System for I-77 from the South Carolina State Line to a point north of the Sunset Road interchange as a Phase I endeavor with an ultimate future configuration which could provide monitoring, incident response and motorist information for approximately 150 miles of expressways in the Charlotte area;

NOW, THEREFORE BE IT RESOLVED: That the Charlotte-Mecklenburg Metropolitan Planning Organization, made up of elected officials from the City of Charlotte, Mecklenburg County; the towns of Davidson, Cornelius, Huntersville, Pineville, Matthews and Mint Hill, express their support for this CARAT porposal and recommend funding of this proposal by the U. S. Department of Transportation

Adopted this 18th day of March, 1992.



Mayor Russell Knox, Chairman
Charlotte-Mecklenburg
Metropolitan Planning Organization